TURN SPECIFIC VS. LINK BASED TRAVEL TIMES CALCULATED FROM FLOATING CAR DATA (FCD)

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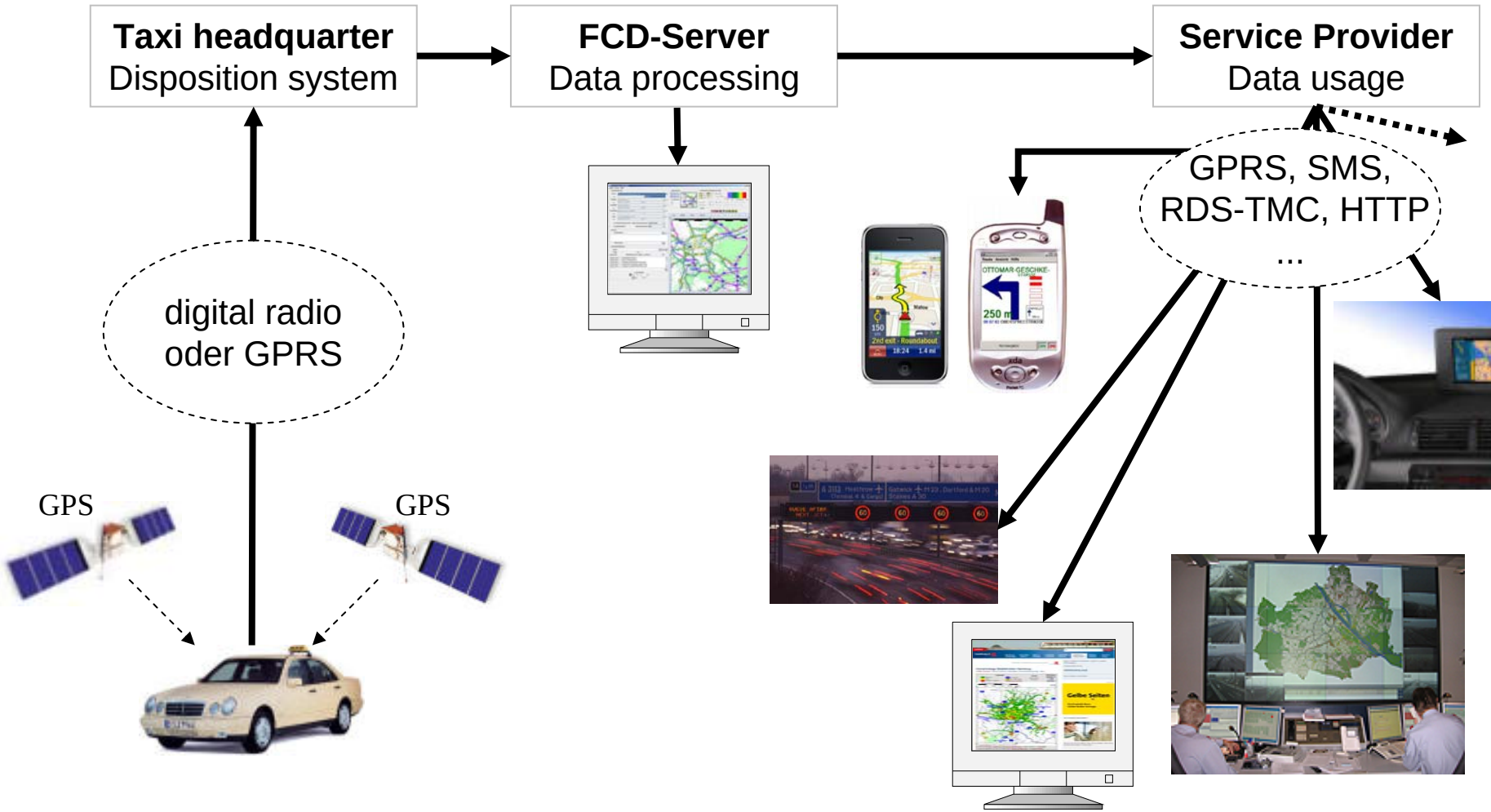
World Conference on Transport Research (WCTR)
July 11-15, 2010, Lisbon

FCD – System architecture

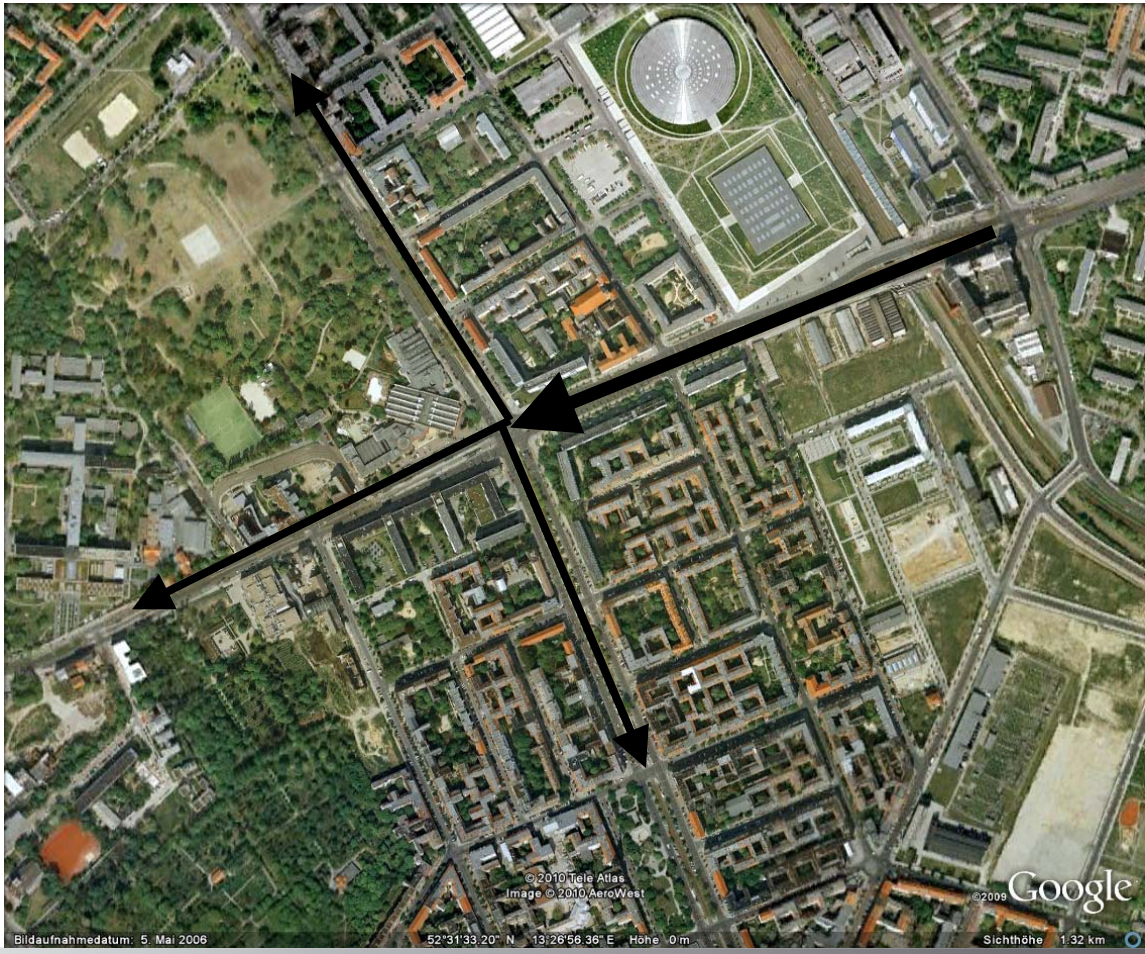


Problem description

- FCD/PVD is excellent traffic data source for provision of travel times
- Travel times are provided for each street segment (or TMC segment)
- Handling of turns in navigation and route planning: additional travel times
  - Right-turns: 5 seconds (example)
    - Waiting for pedestrians, cyclists
  - Left-turns: 10 seconds (example)
    - Waiting for pedestrians, cyclists
    - Waiting for oncoming traffic
  - Sometimes dependent on intersection type / street types
- Is this really a good solution?
  - Are these assumptions always approximately valid?
  - What if a jam on a segment is only for vehicles driving straight on?
  - …
- Suggestion: Hold turn dependent travel times on street segments

Approach – Turn Dependent Decomposition of FCD

- Definition of an inflow to an intersection
- Definition of the turn sections



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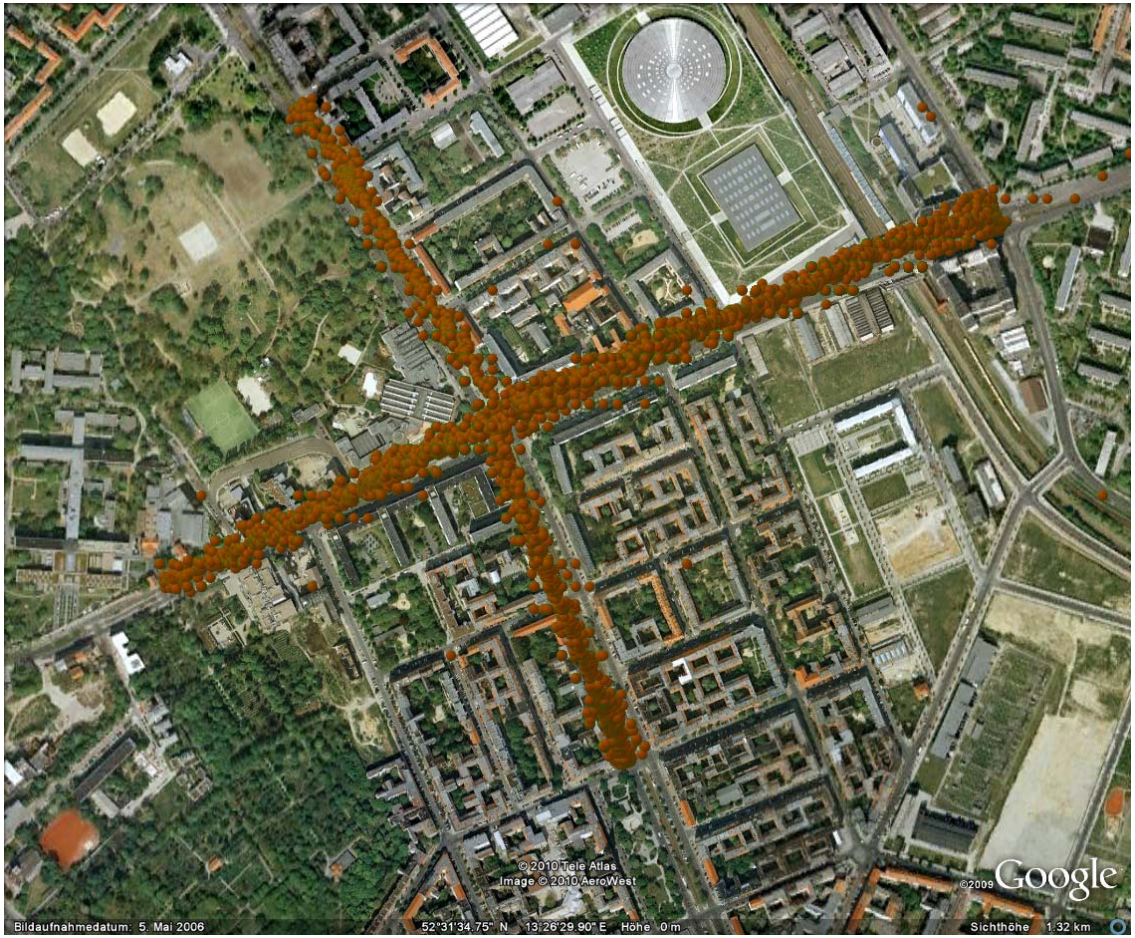
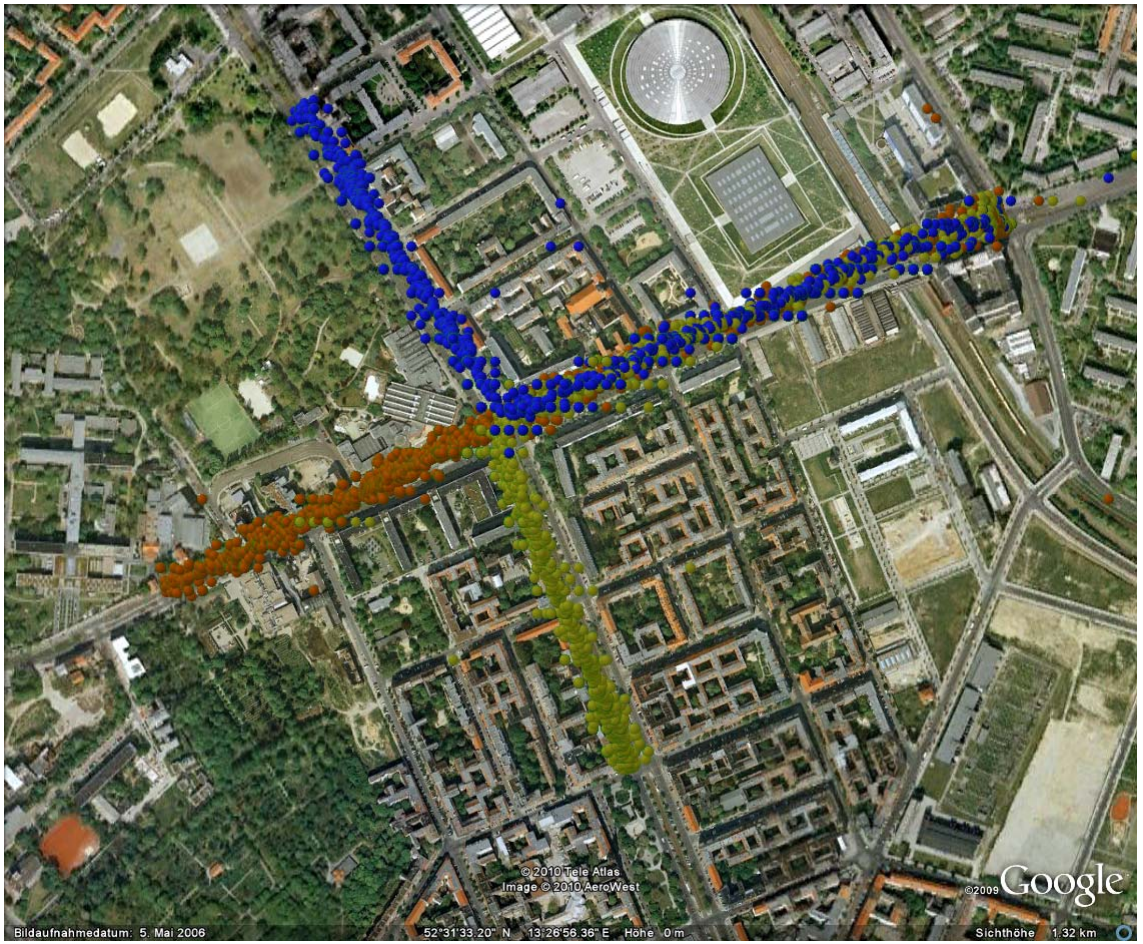


Approach – Turn Dependent Decomposition of FCD

- Definition of an inflow to an intersection
- Definition of the turn sections
- Decomposition of all data related to the street segments



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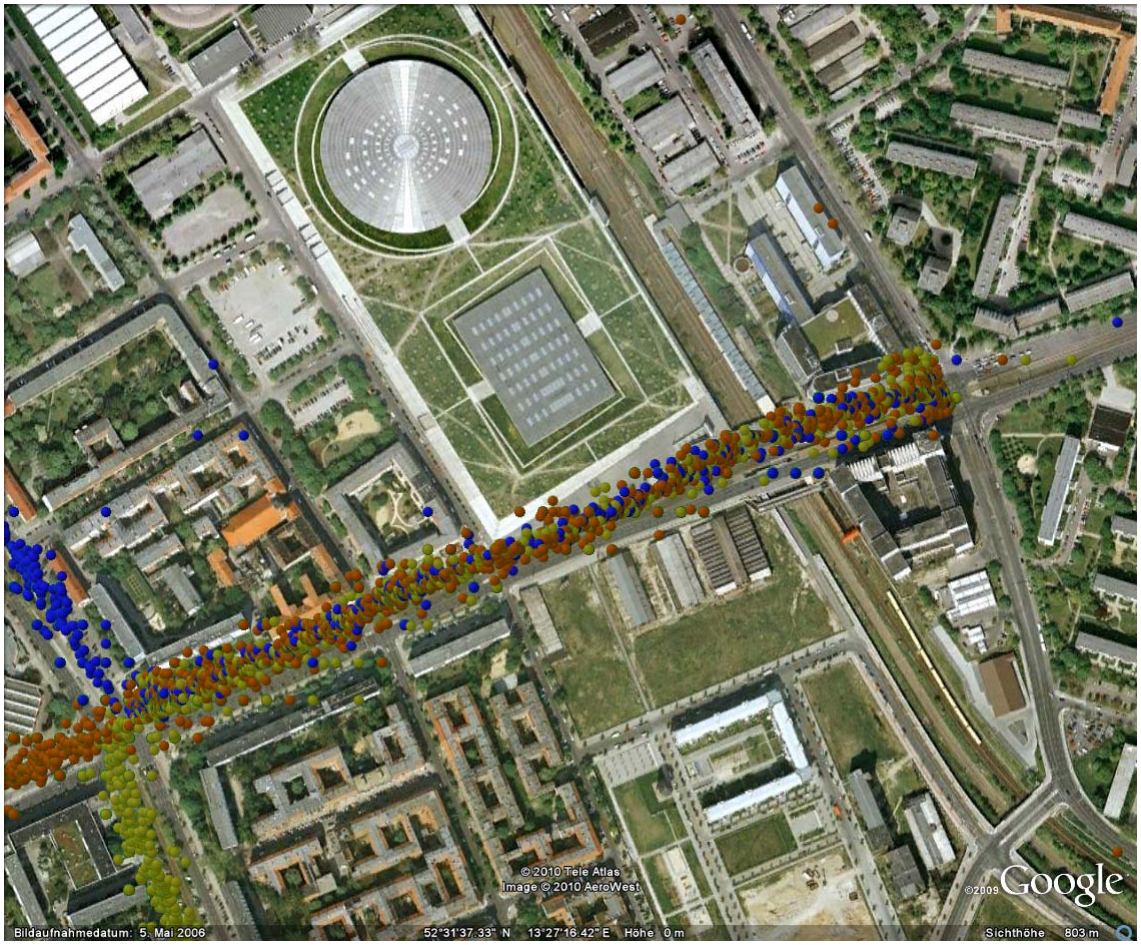
Approach – Turn Dependent Decomposition of FCD

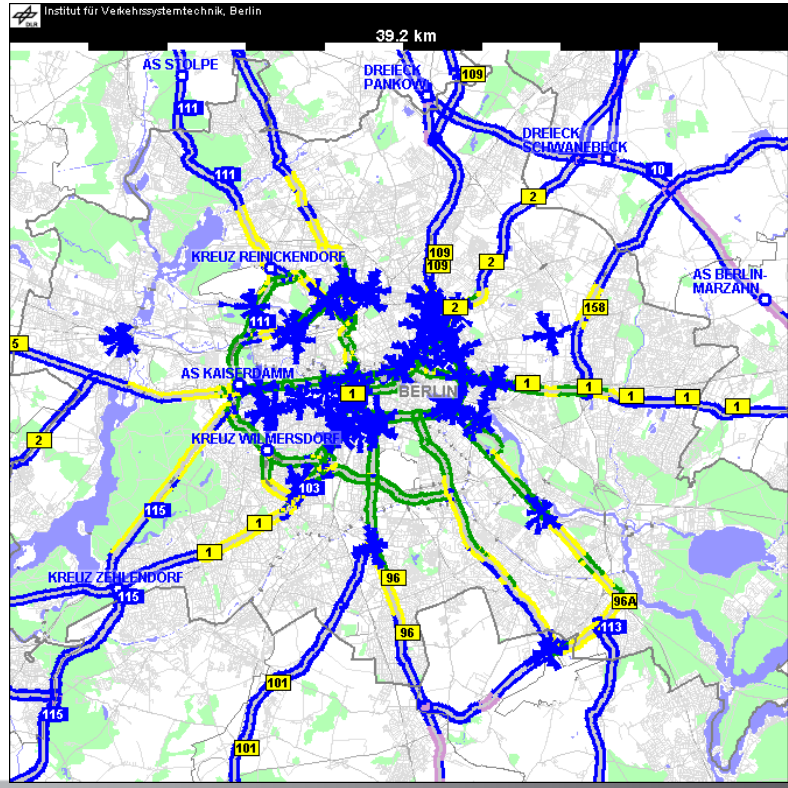
- Definition of an inflow to an intersection
- Definition of the turn sections
- Decomposition of all data related to the street segments
- Comparison of travel times for the inflow section



Data set

- About 4300 Taxi-Floating Cars in Berlin
- Delivering Positions with time stamp every 30 seconds
- Data of about four months (08.01.2010 – 30.04.2010)
- Analysis of 42 crossings and 162 inflow sections

Data from taxis every
green: < 10 min
yellow: < 20 min
blue: >= 20 min

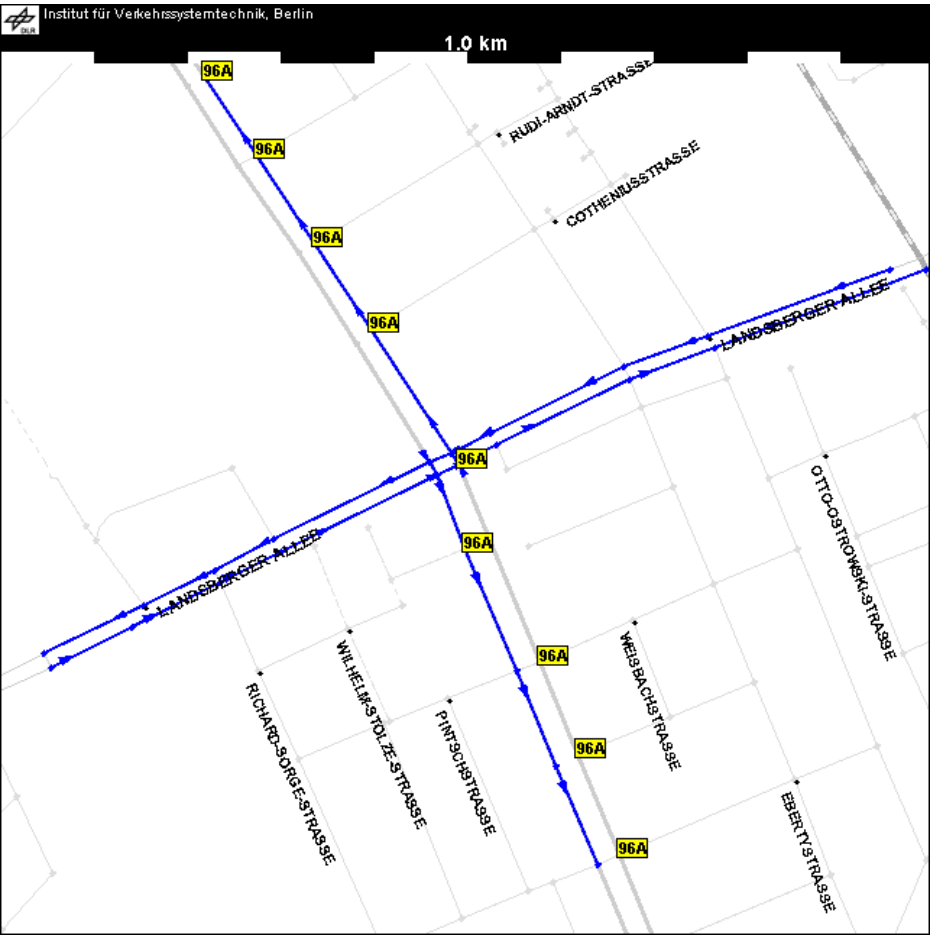


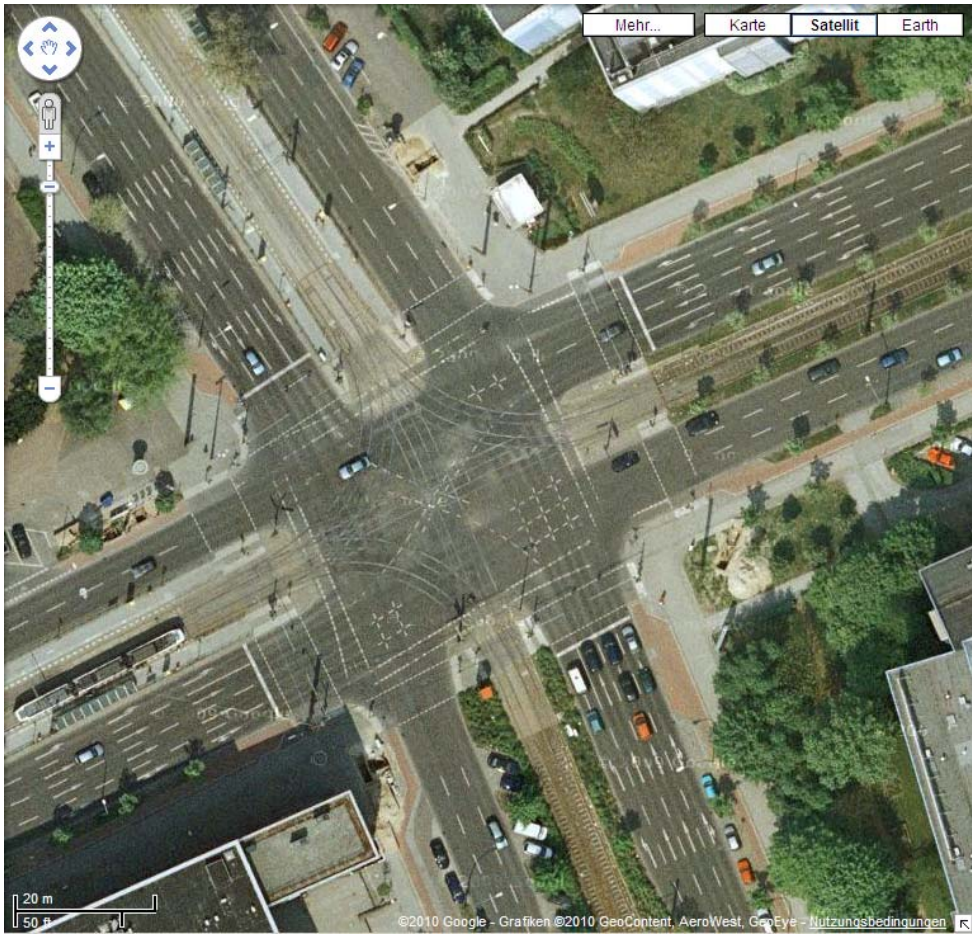
Calculation of travel times for inflow segments

- Calculate travel time **tt** on inflow segment for each vehicle
- Group in daytime intervals **i** of 15 Min
- Median value over period of 4 months
- Data smoothing by averaging median values with interval before and after:

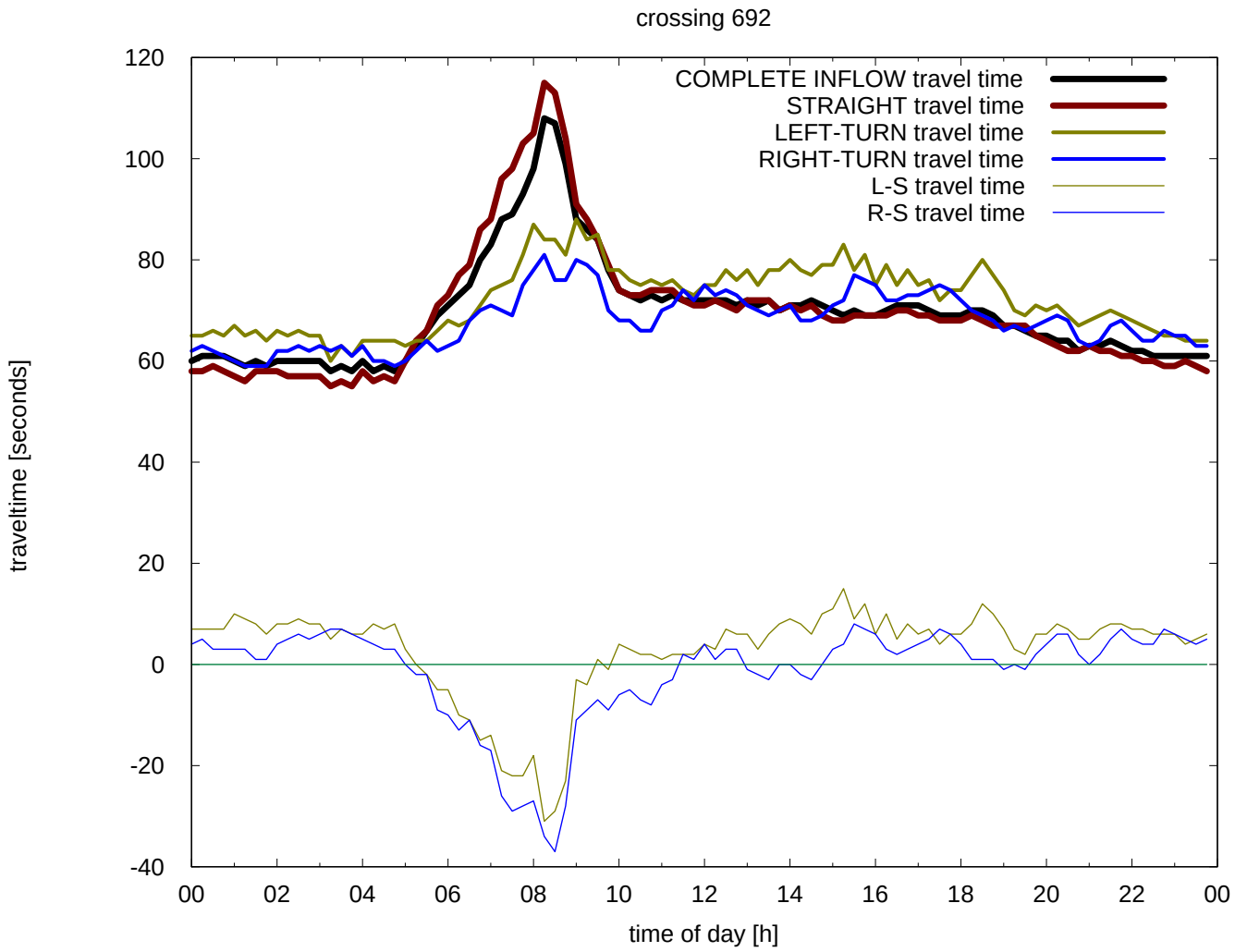
$$tt_{i\,(smoothed)} = (tt_{i-1} + tt_{i} + tt_{i+1}) / 3$$

Results - crossing 69

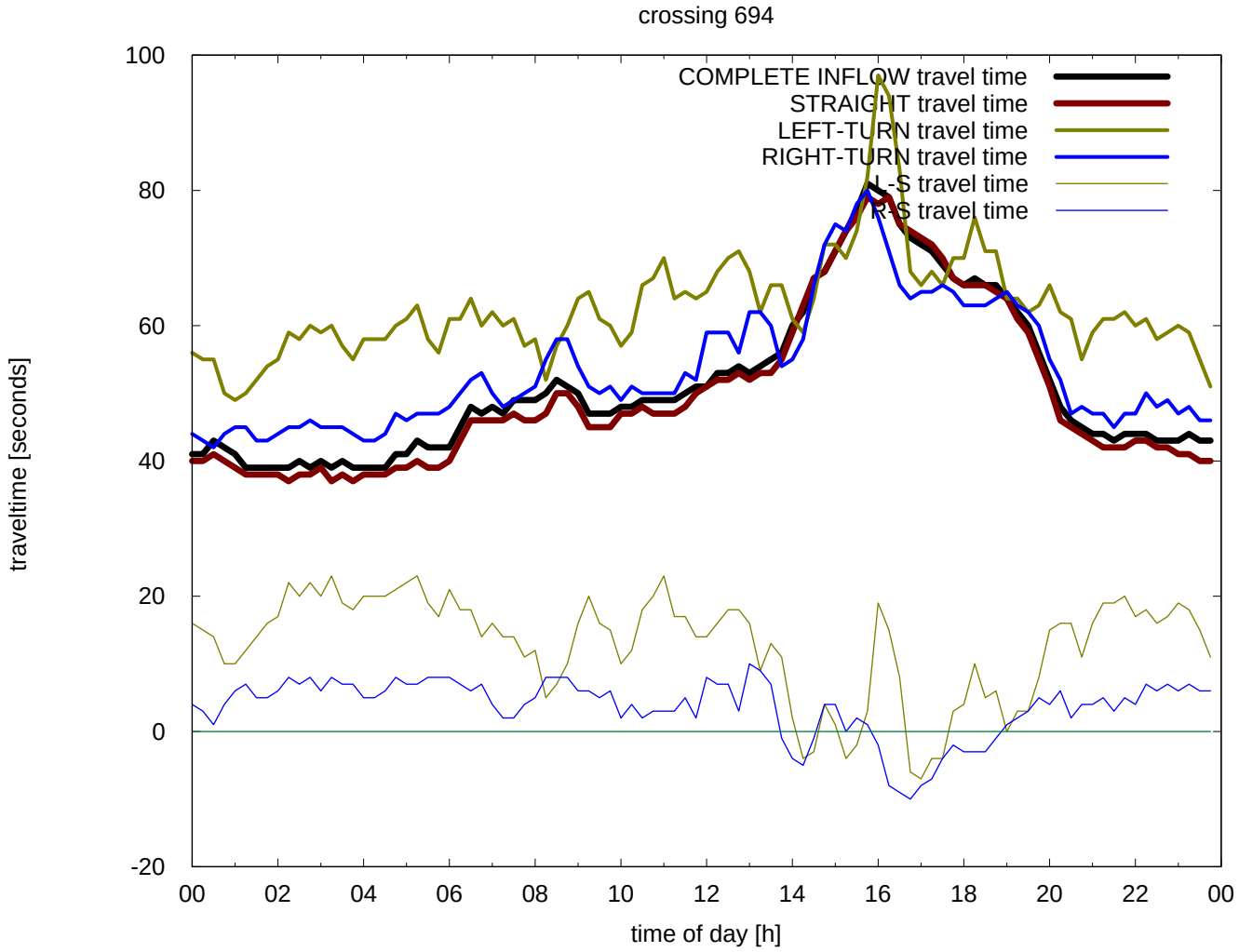




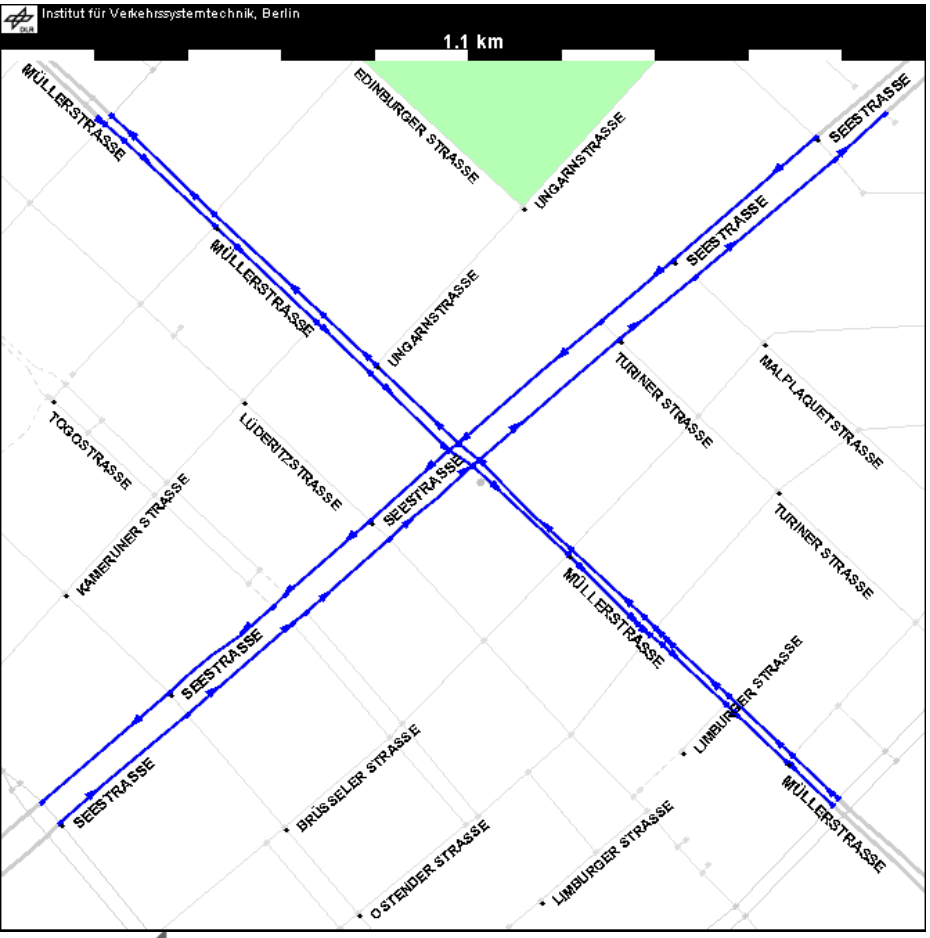
Results - crossing 69

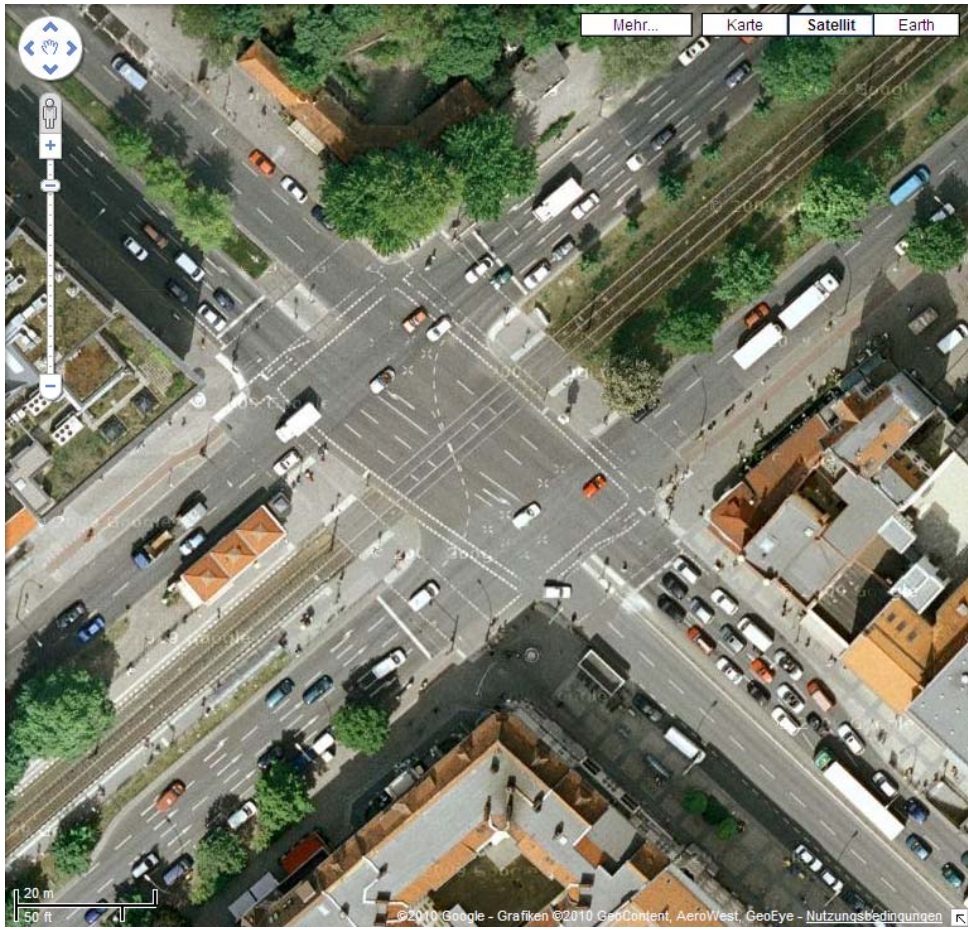


Results - crossing 69



Results - crossing 35





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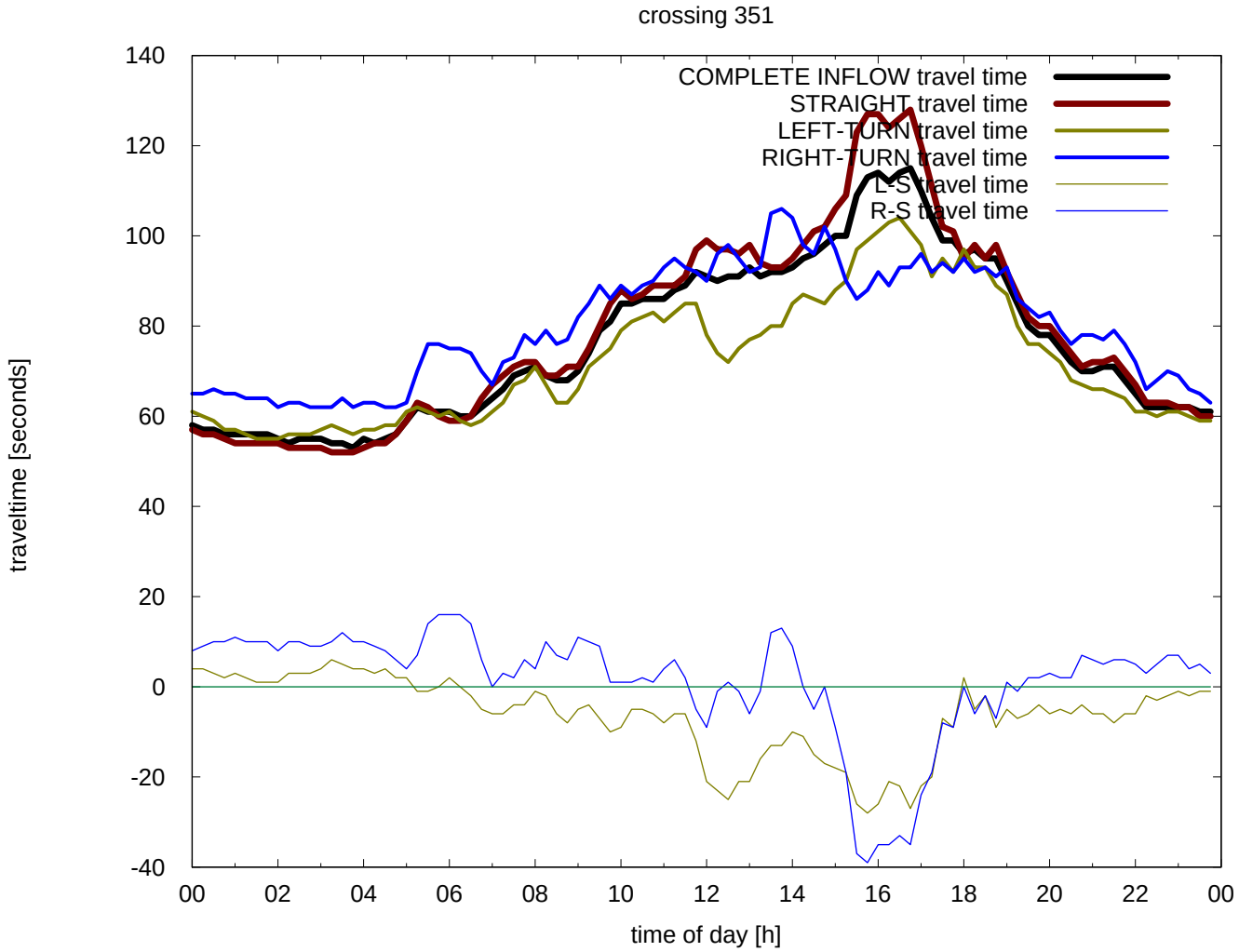
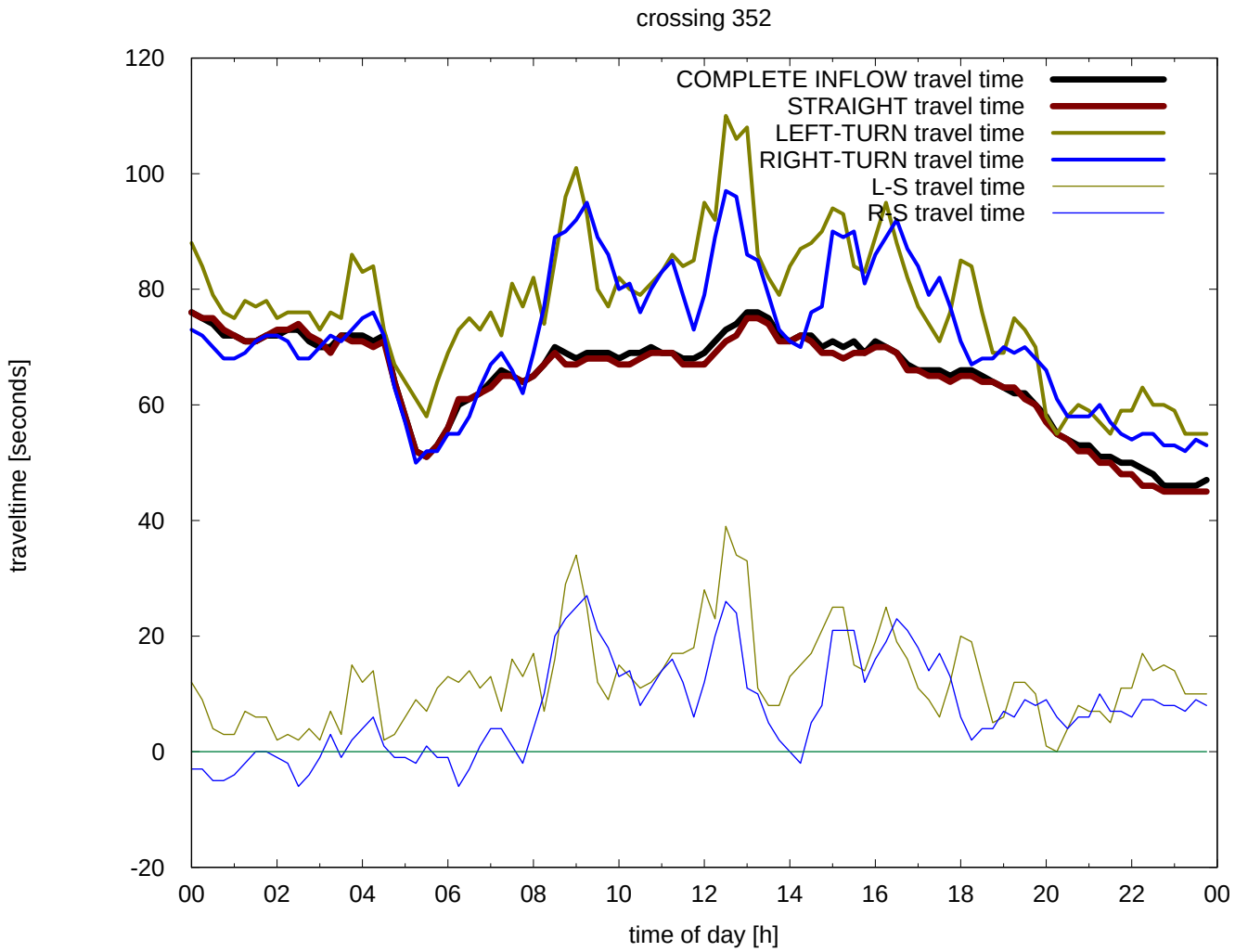


Results - crossing 35



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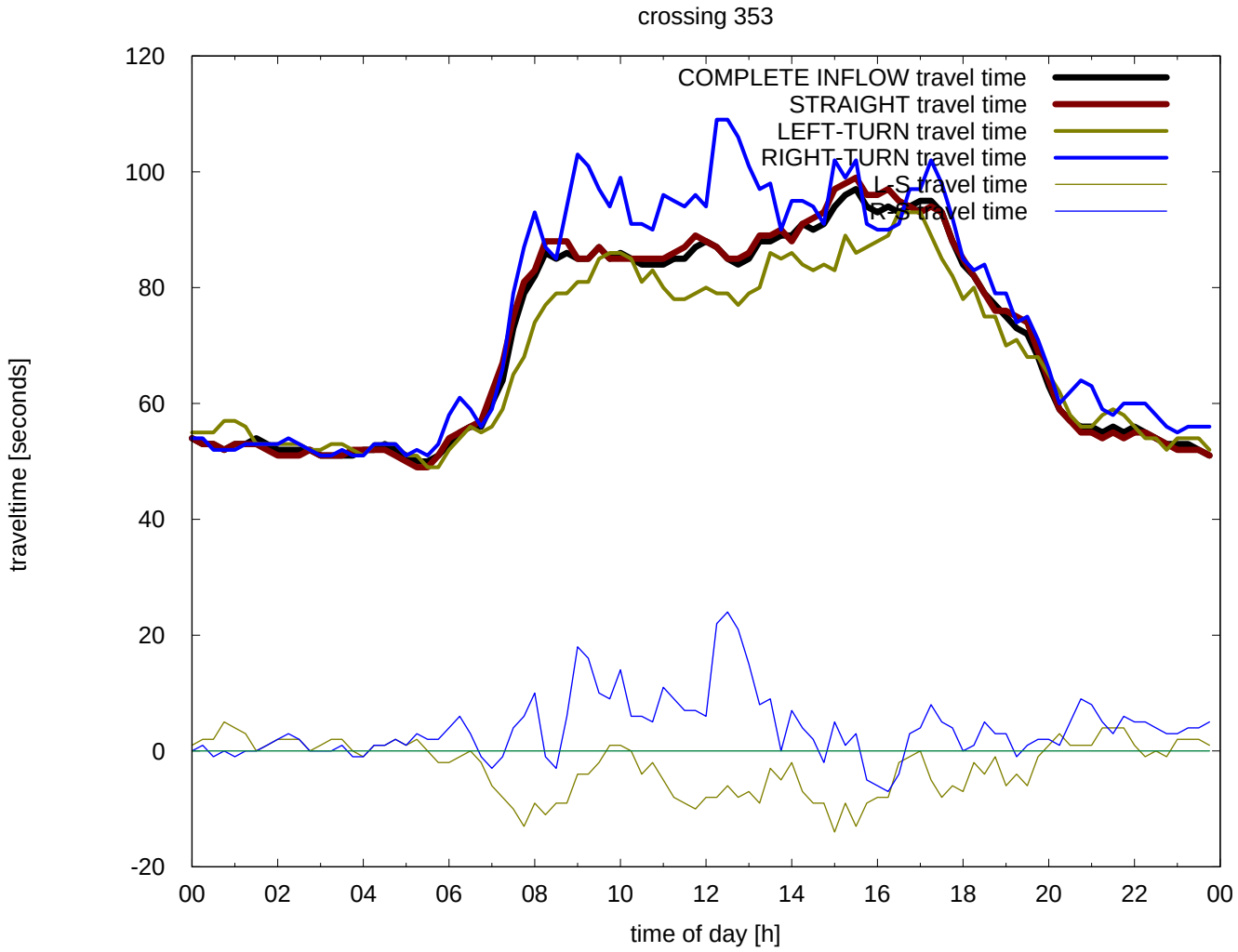

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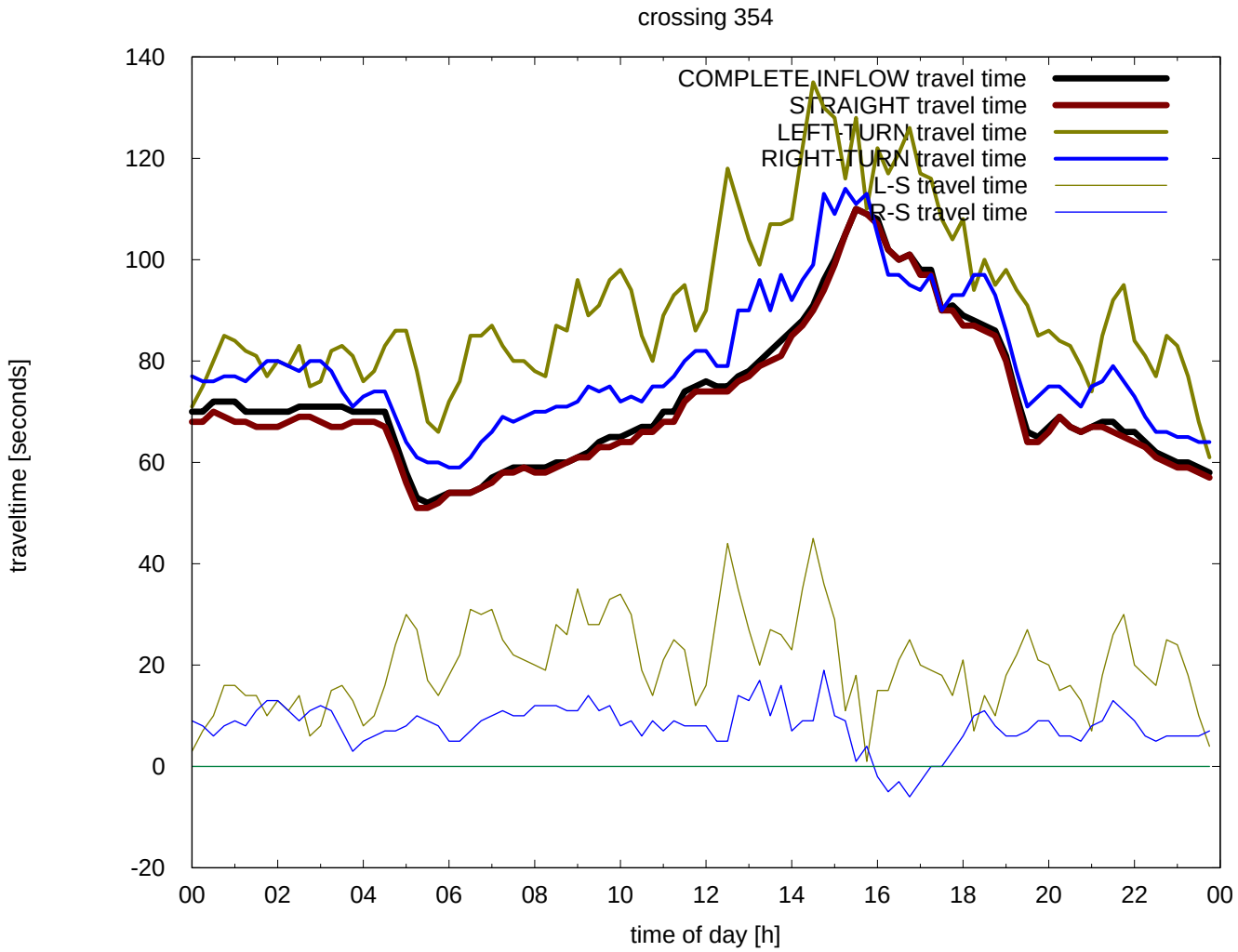
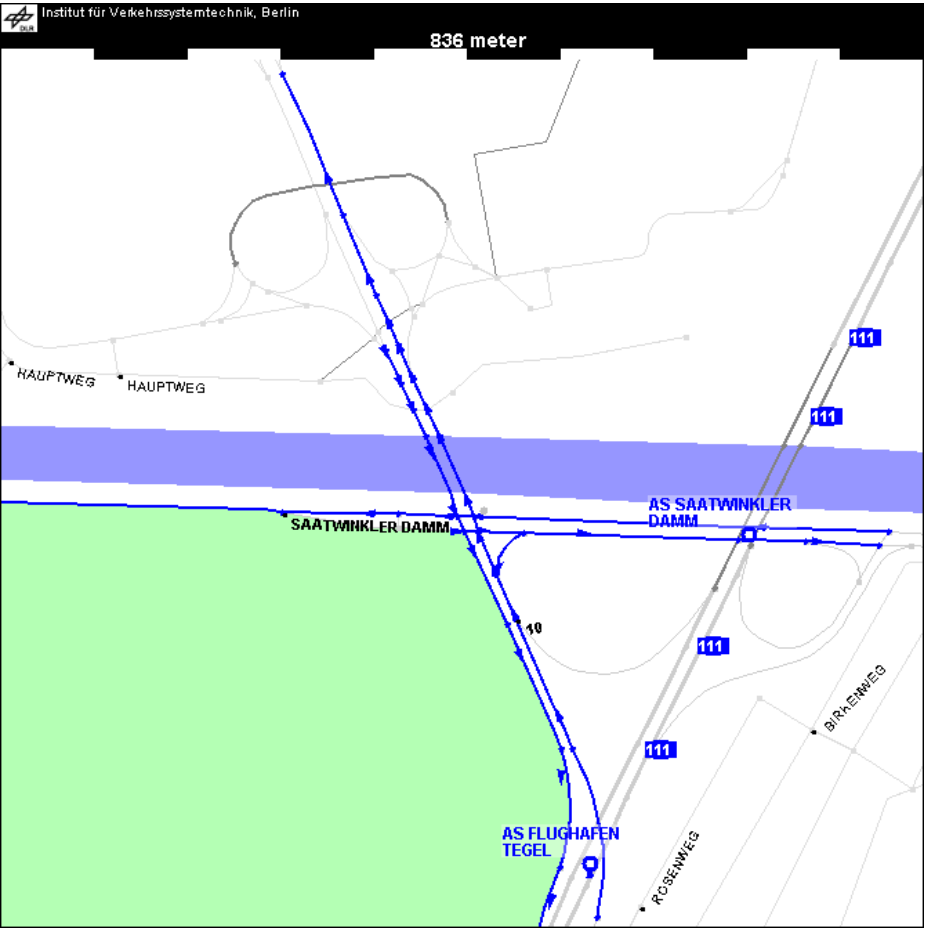
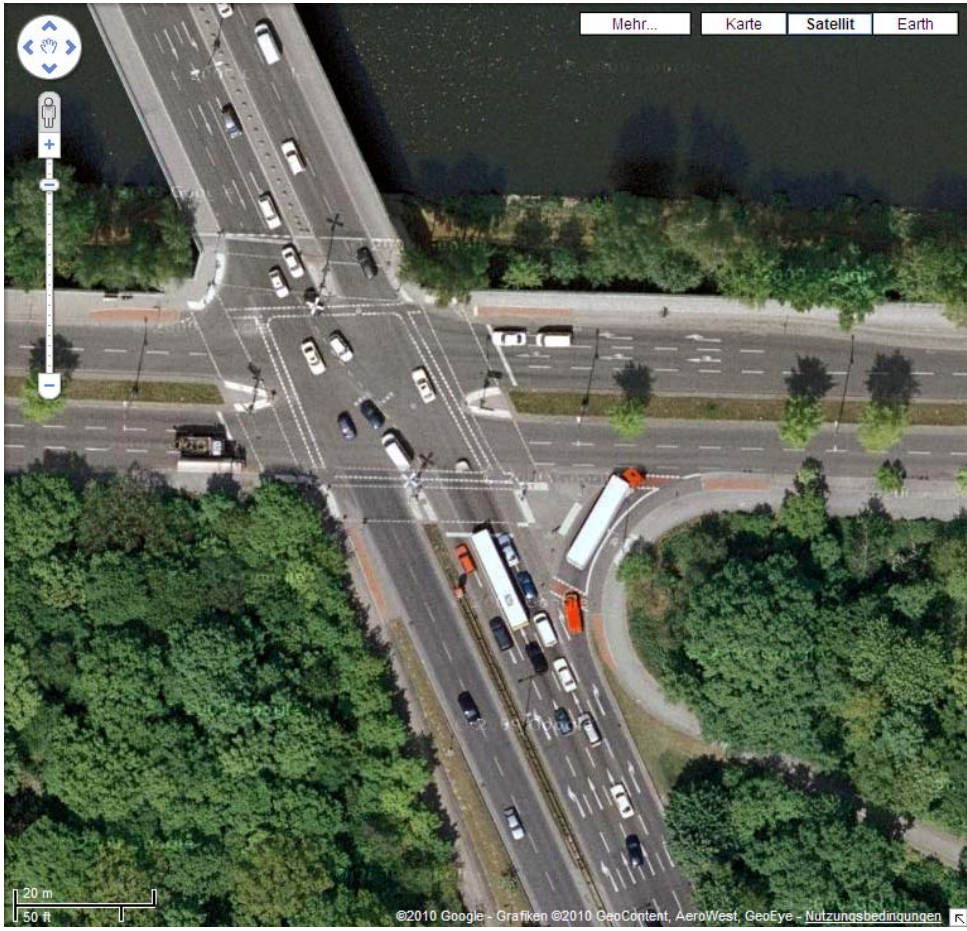


Results - crossing 12





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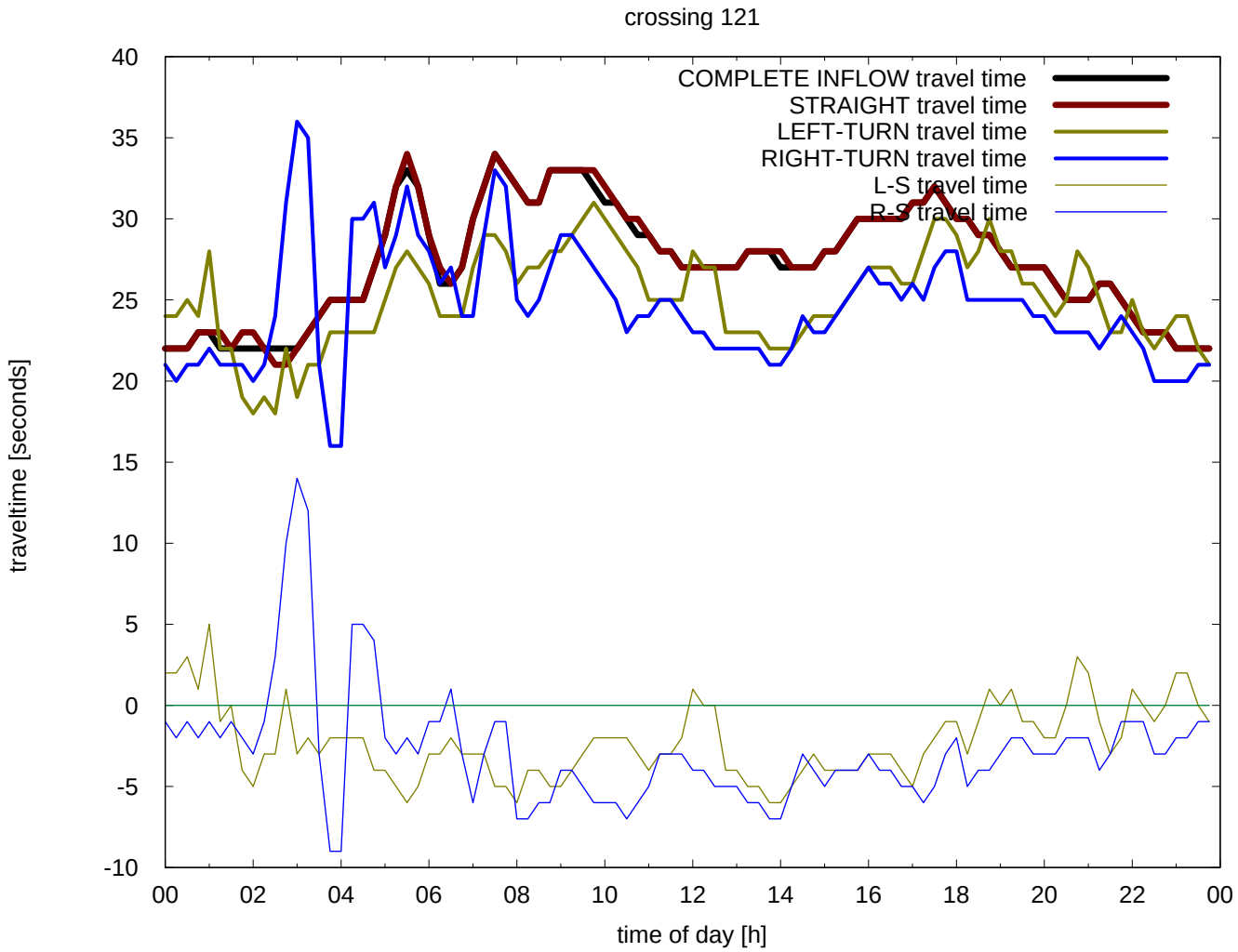

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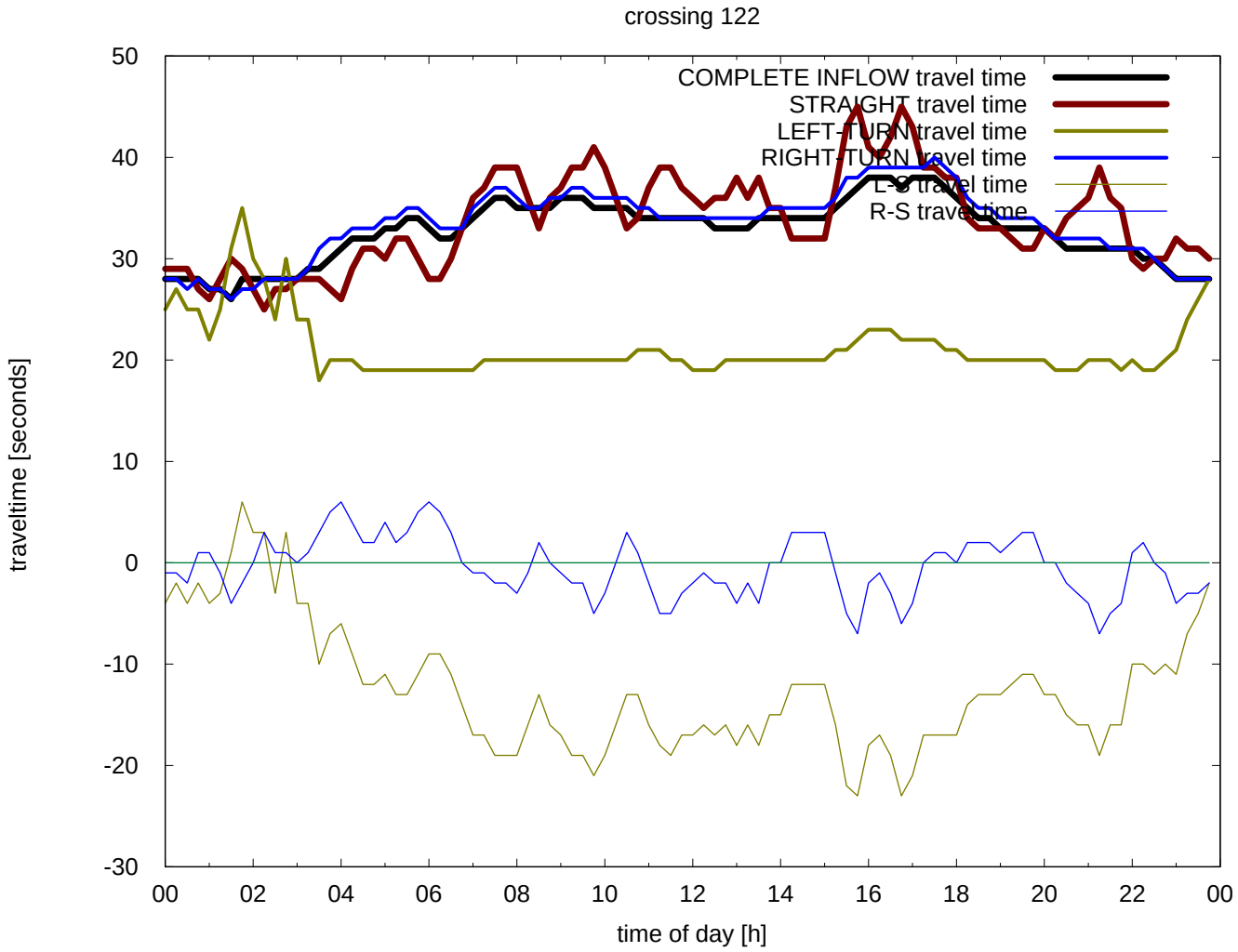

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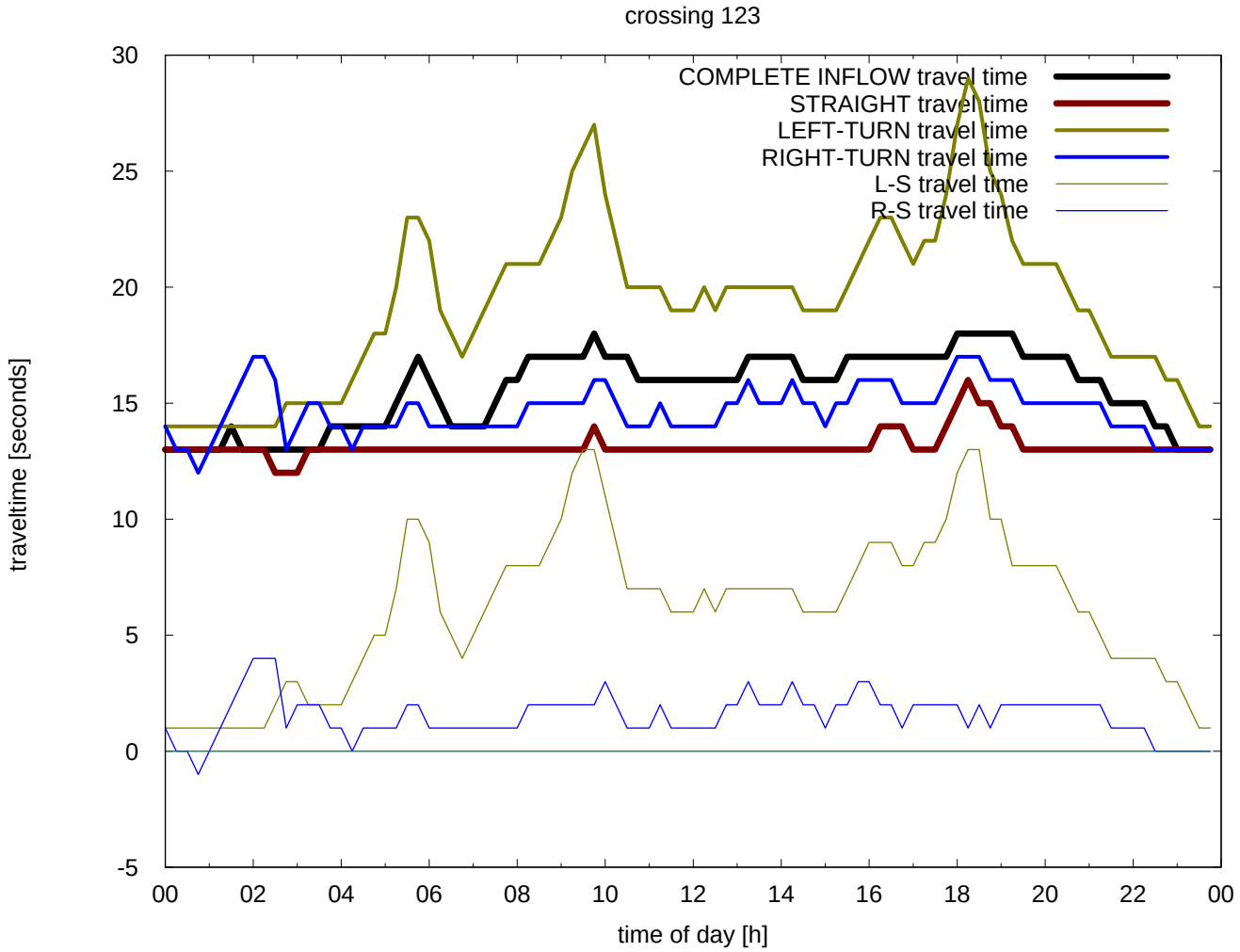
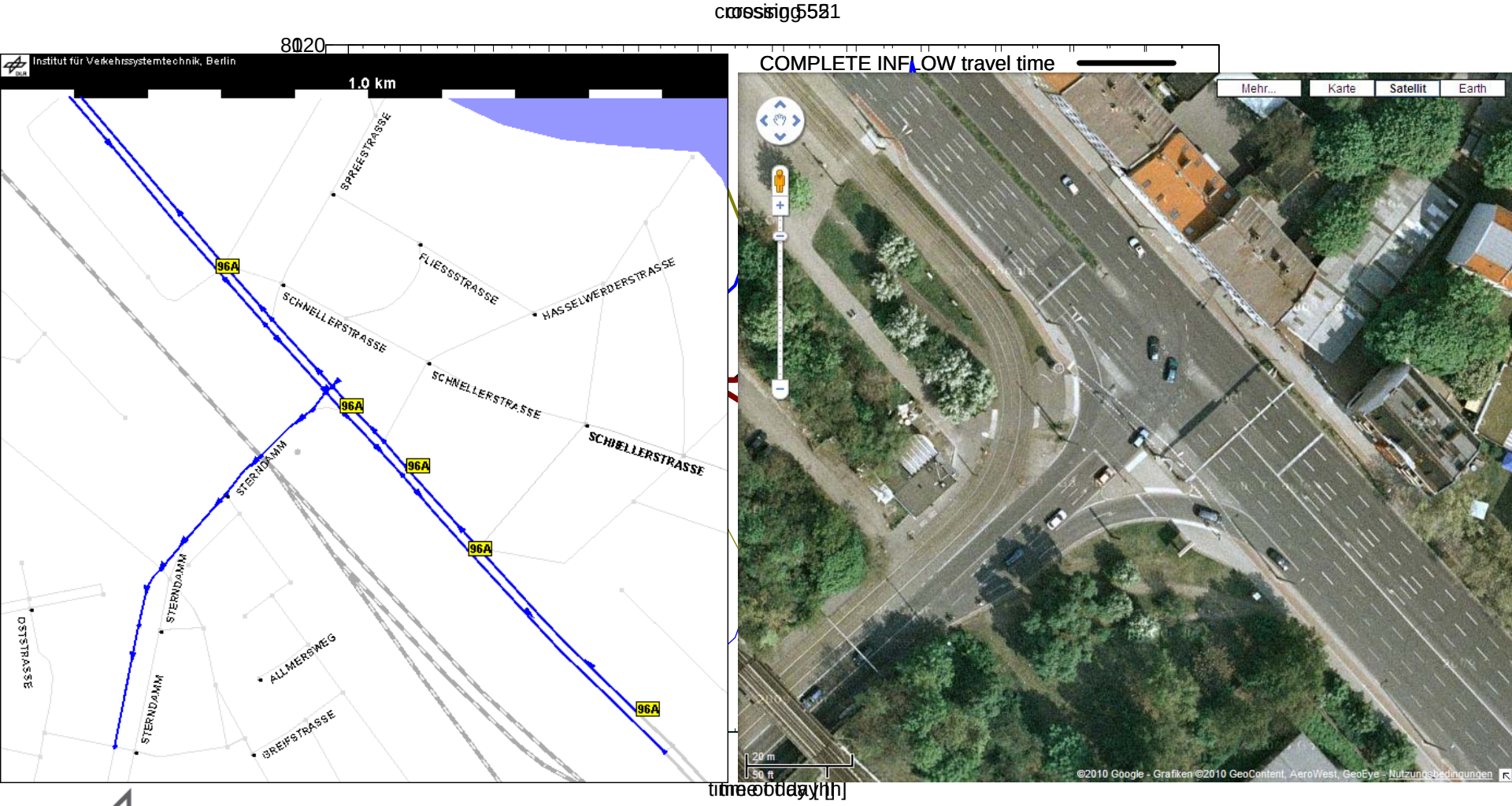


Results - crossing 55



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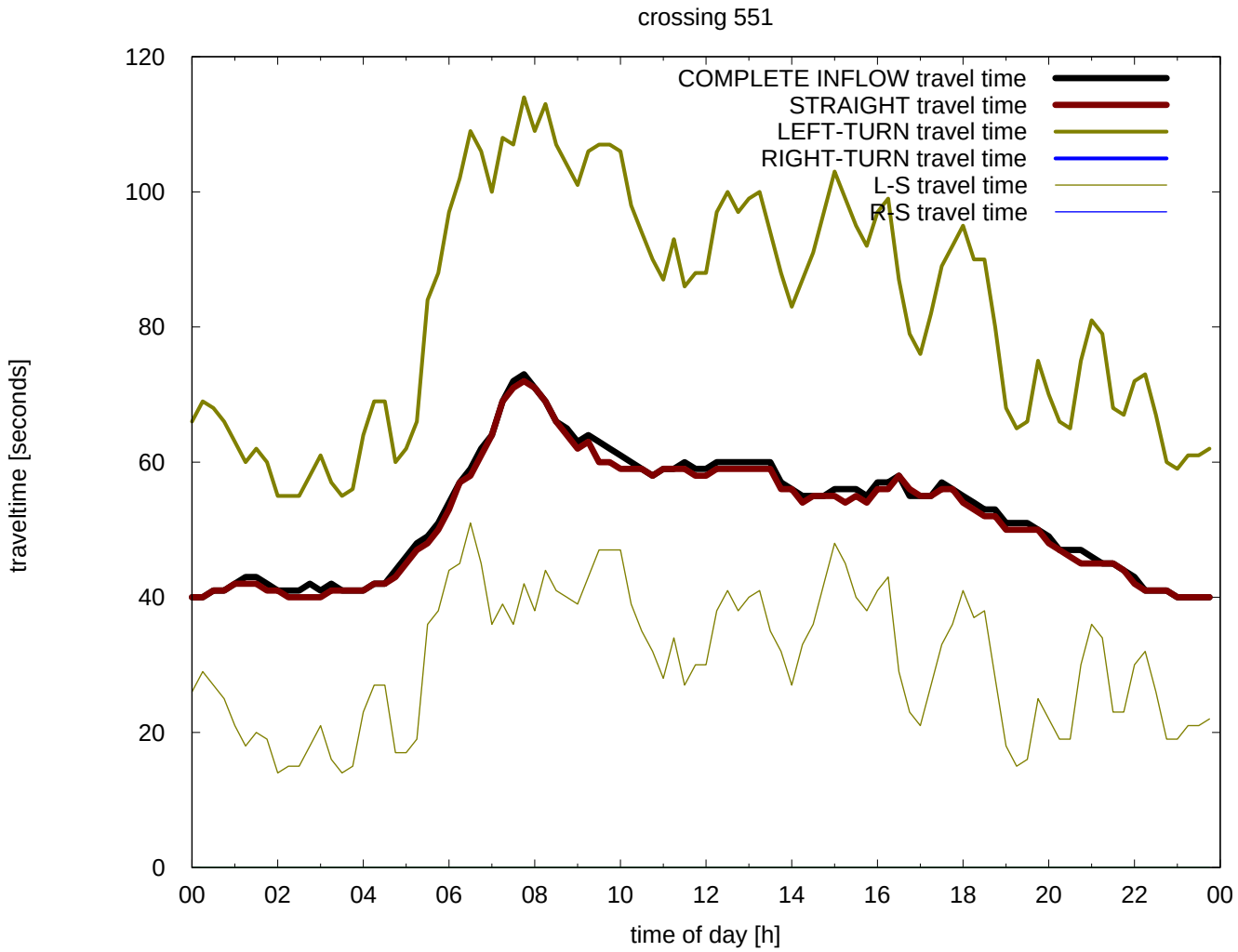

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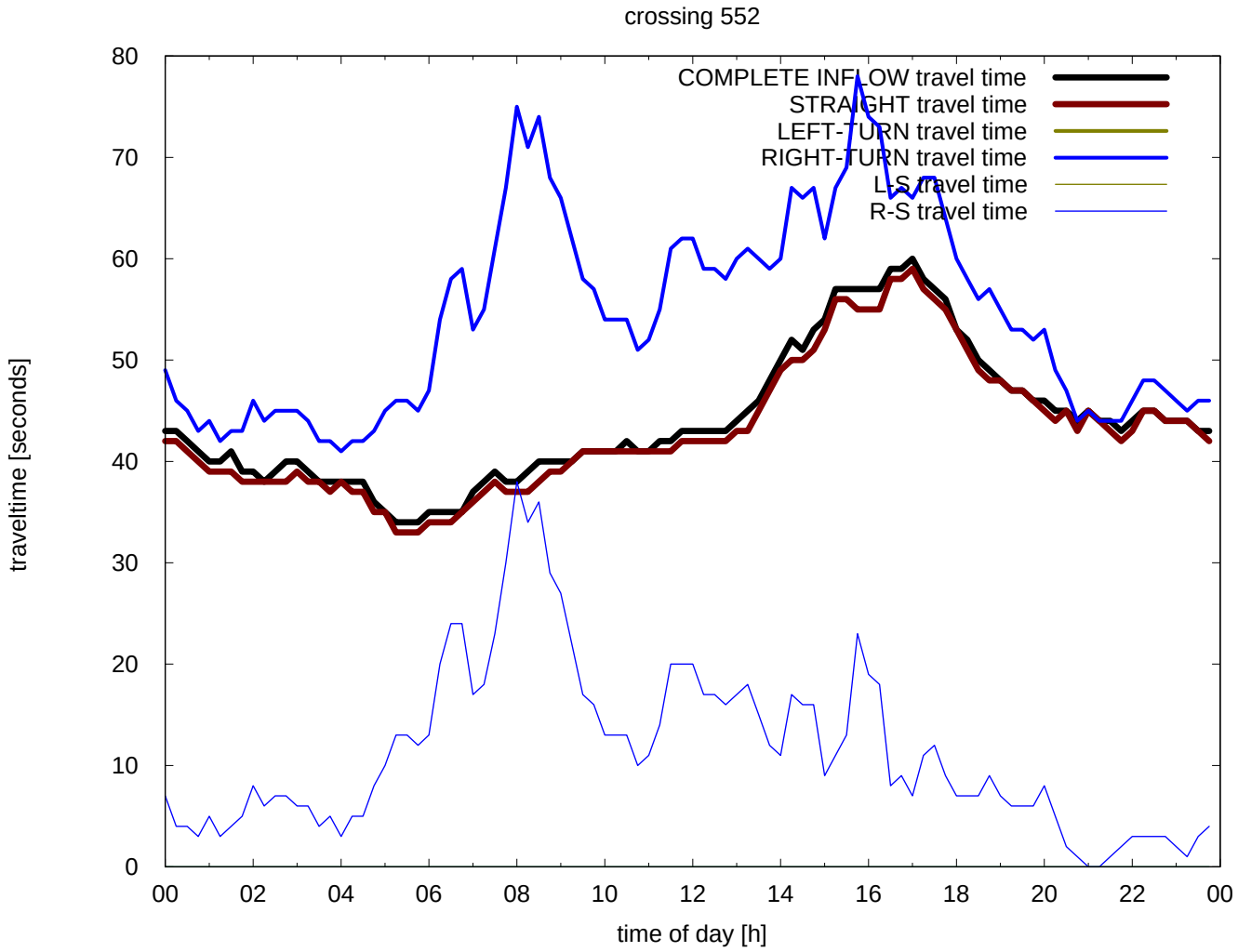

Summary & Conclusion

- Simple additional travel time for left-/right-turns not appropriate for accurate routing
- Dependence on time of day and traffic volumes
- Reasons for distinction of different turning directions may be manifold
  - Pedestrians+bicycles (for turners)
  - Oncoming traffic (left turners)
  - Length of turning lanes
  - Downstream congestions
  - Traffic signal plans
  - Separate signalisation for turning vehicles
- Future research: structural categorisation of effects
- Analyses may also be conducted for optimization of traffic signal plans.

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